



## National Climate Change and Wildlife Science Center Project Accomplishments: Highlights

*The National Climate Change and Wildlife Science Center (NCCWSC) has invested more than \$20M since 2008 to put cutting-edge climate science research in the hands of resource managers across the Nation. With NCCWSC support, more than 25 cooperative research initiatives led by U.S. Geological Survey (USGS) researchers and technical staff are advancing our understanding of habitats and species to provide guidance to managers in the face of a changing climate.*

*Projects focus on quantifying and predicting interactions between climate, habitats, species, and other natural resources such as water. Spatial scales of the projects range from the continent of North America, to a regional scale such as the Pacific Northwest United States, to a landscape scale such as the Florida Everglades. Time scales range from the outset of the 20th century to the end of the 21st century. Projects often lead to workshops, presentations, publications and the creation of new websites, computer models, and data visualization tools.*

*Partnership-building is also a key focus of the NCCWSC-supported projects. New and on-going cooperative partnerships have been forged and strengthened with resource managers and scientists at Federal, tribal, state, local, academic, and non-governmental organizations. USGS scientists work closely with resource managers to produce timely and relevant results that can assist managers and policy makers in current resource management decisions. This fact sheet highlights accomplishments of five NCCWSC projects.*

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### Managing the Nation's Fish Habitat



*Little Colorado River, Arizona.*

To protect and enhance aquatic habitats nationwide, resource managers need to know what habitats are most vulnerable in our rapidly changing climate. One tool used to assess habitat vulnerability is downscaled mathematical models of decadal-scale global climate, or general circulation models (GCMs). In the study *Managing the Nation's Fish Habitat at Multiple Spatial Scales in a Rapidly Changing Climate*, researchers will downscale an atmosphere-ocean GCM (AOGCM) to identify how climate and land-use change will affect fish habitats at national, regional, and local scales.

Fourteen principal investigators and the same number of technical and academic staff at 10 state, academic, and government agencies in 8 states are executing the multi-scale project. Among the project results are regionally specific metrics to assess vulnerability of the habitats of, for example, economically important smallmouth bass in the Northern Glacial Lakes region or eastern brook trout in the Northeast United States. Map-based tools will be generated that can be used as part of a decision support system for natural resource managers to assess present risks and plan for potential risks to local resources.





Collaborative relationships have been established with local and regional habitat management groups such as the Eastern Brook Trout Joint Venture and the Desert Fish Habitat Partnership. In 2011, this project connected climate knowledge with fisheries professionals by hosting a climate change symposium at the national American Fisheries Society Annual Meeting.

Learn more about the progress of this far-reaching study at <http://fishhabclimate.org/>.

## Aiding Conservation and Management of Florida's Biodiversity



*Manatees are one of the many unique species that thrive in the Everglades.*

Florida has high species diversity: at least 4,000 species of flowering plants, including more than 700 species of trees; 90 species of mammals; 52 amphibians; 88 reptiles; 500 birds; and more than 250 freshwater fish, many of which are endangered. How will Florida's high biodiversity respond to a changing climate? Which species and habitats will increase or decrease? What role do changes in land use and land cover play? Answers to these questions are of critical concern to resource managers. This project seeks to understand and predict how climate and associated land use changes will affect key natural resources in Florida and adjacent states in the southeastern United States.

For this project - *A Land of Flowers on a Latitude of Deserts: Aiding Conservation and Management of Florida's Biodiversity* - 22 scientists at 8 Federal and academic research centers in Florida are downscaling GCMs to regional levels. Hourly precipitation and surface temperature data from a downscaled AOGCM are used in ecological models for the Suwannee River, a relatively undisturbed system, and the Florida Everglades, a highly-impacted tropical system. Some key products of this study are a tested downscaling methodology and ecological models that explicitly address imperiled biota including the Florida manatee, American crocodile, alligator, snail kite, and wood stork, as well as recreational and commercial fishery species such as snook, snapper, and grouper.

Since 2009, the project team has shared information with resource managers and scientists from the Florida Department of Environmental Protection, U.S. Fish and Wildlife Service, National Park Service, U.S. Army Corps of Engineers, and several Florida universities. Additionally, study results will be published in the *Journal of Geophysical Research-Atmospheres* and *Climate Dynamics*. Data also are being shared with studies supported by the Greater Everglades Priority Ecosystem Studies Initiative.

Learn more about this biodiversity management and conservation project at [http://fl.biology.usgs.gov/climate/la\\_florida.html](http://fl.biology.usgs.gov/climate/la_florida.html).

## Avian Conservation in the Prairie Pothole Region, Northern Great Plains

The Prairie Pothole Region (PPR) contains some of the most extensive wetland habitat in the Great Plains. The PPR covers four Canadian provinces and five states in the United States, and is an important stopover point and breeding area for migratory birds travelling from the Arctic to South America. Most of the PPR wetlands may be particularly vulnerable to climate change because of their shallow depths and the expected increases in evaporation rates, although estimates are complicated by a great diversity of wetland and soil types, land uses, and the renowned variability in annual water conditions. To better characterize the vulnerability of this critical habitat, 17 scientists, graduate students, and resource managers from 8 government, academic, and cooperative resource management groups across several states are working together to develop a comprehensive, integrated picture of how wetland processes and biotic communities may respond to a changing climate. Birds, climate, and wetlands are the main topics of the study, *Avian conservation in the Prairie Pothole Region, northern Great Plains: Understanding the links between climate, ecosystem processes, wetland management, and bird communities*.

The final written synthesis report for resource managers will describe how historical and projected climate change, natural processes, and human activities affect wetland habitats and wetland-dependent birds. The document will include conceptual and empirical models to help resource managers visualize



*Aerial view of Prairie Potholes*



and understand the interrelationships among components and processes of wetland and climate changes.

Since 2009, project scientists have given 19 presentations at 18 meetings, agencies, or organizations in 3 countries. In March 2010, USGS project scientist John Stamm discussed the Prairie Pothole climate change research on public radio in South Dakota. Other products to date include a fact sheet and nine peer-reviewed publications.

*Learn more about this synthesis project from Skagen and Melcher (2011), available at <http://pubs.usgs.gov/fs/2011/3030/>.*



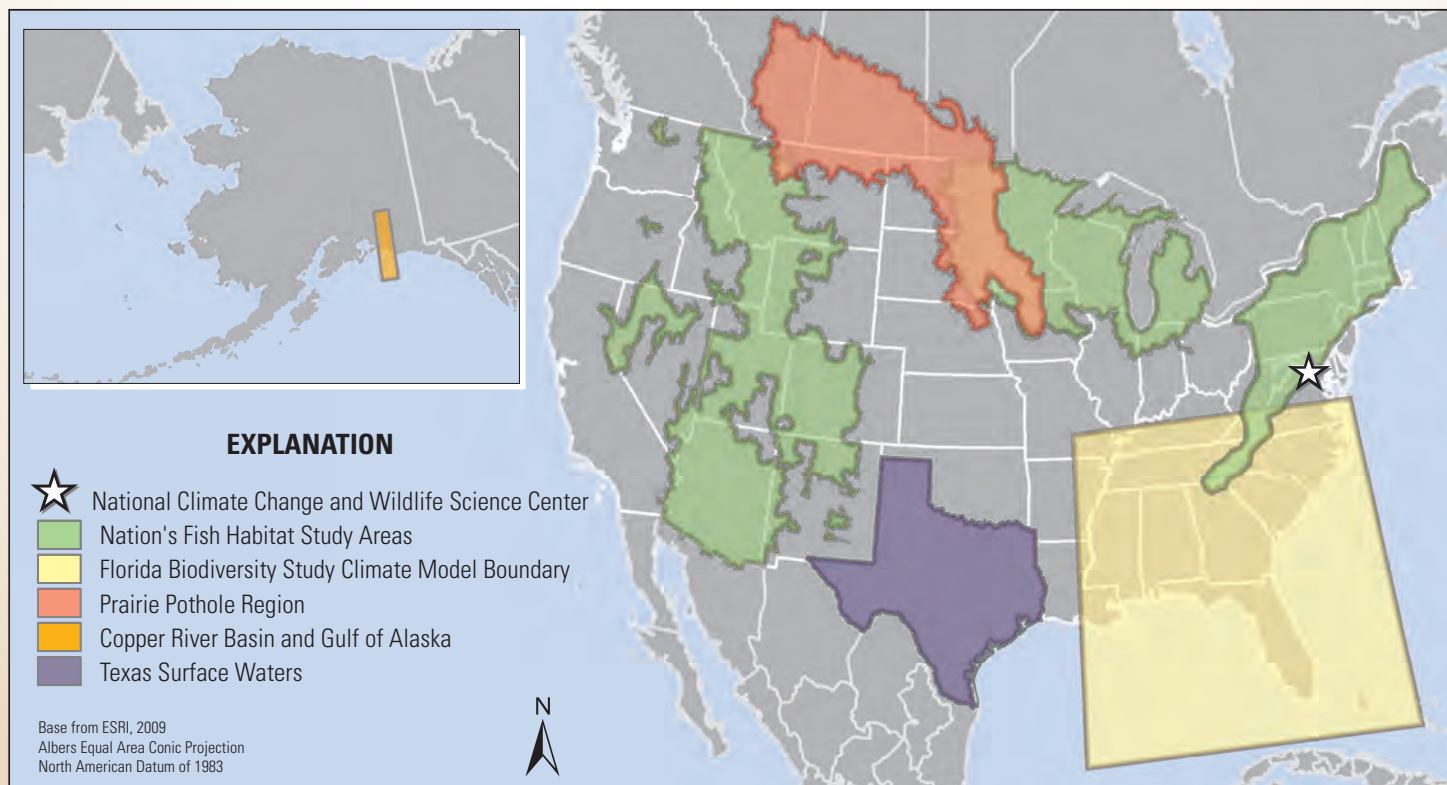
*The Prairie Pothole Region is an important breeding habitat for the Marbled Godwit (*Limosa fedoa*). The Godwit is a “Species of High Concern” (The U.S. Shorebird Conservation Plan, [U.S. Fish and Wildlife, 2011; <http://www.fws.gov/shorebirdplan/>]) because of its small numbers and significant habitat loss or degradation.*

## Impacts of Climate Change and Melting Glaciers on Coastal Ecosystems in the Gulf of Alaska

The Gulf of Alaska contains important populations of fish and seabirds, whose food sources, phytoplankton and zooplankton, are dependent on delivery of glacier-derived nutrients from the Copper River and other sources. How will accelerated glacial melting resulting from climate change over the next 50 years affect the physical and chemical processes that sustain the unique Gulf of Alaska and Copper River coastal ecosystems? This question is the focus of the study, *Impacts of climate change and melting glaciers on coastal ecosystems in the near-shore waters of the Gulf of Alaska*.

Eleven scientists in 5 states are leading the project that consists of terrestrial and marine fieldwork, remote sensing, and modeling. An extensive field campaign in 2010 included three oceanographic cruises studying the Copper River plume and the adjacent continental shelf, six monthly river-sampling trips, and monitoring the discharge of several rivers. Modeling of these systems is also underway, including a predictive physical-biological ecosystem model of the Gulf of Alaska. Additionally, a glacier module is being added to an existing widely used hydrologic model. Model simulation results as well as mapping of current glacial extents using high-resolution satellite imagery will help scientists and resource managers assess the ecosystem effects of future changes in glaciers.

Project leaders shared their findings by chairing a special session at the 2010 American Geophysical Union Fall Meeting, giving eight presentations at two professional meetings, and drafting a publication.



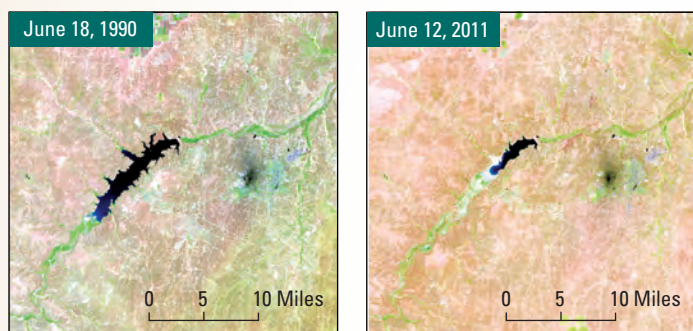
*Major areas of climate studies.*



## Influence of Climate Change on Texas Surface Waters

Water scarcity is a growing concern in Texas, where surface water is derived almost entirely from rainfall. How will climate change affect Texas surface waters? What are the potential effects to the quality of aquatic habitat and the fish and wildlife that it sustains?

To provide insight into climate change effects on surface water and aquatic biota, scientists at the USGS and Texas Tech University initiated a project titled, *Modeling and Projecting the Influence of Climate Change on Texas Surface Waters and their Aquatic Biotic Communities*. The tasks of this study are three-fold: (1) to gather historical water quality information for selected reservoirs in Texas with significant fisheries resources, (2) to develop downscaled statistical models capable of projecting the resulting water temperature patterns in the selected reservoirs, and (3) to assess the effects of the projected changes on populations and communities.



*Shrinking Lake Meredith, Texas.*

A retrospective analysis integrating results of these tasks will determine if any relations exist between changing water temperature patterns or other water-quality parameters and the relatively recent spread of invasive golden alga, which has damaged fisheries resources of Texas and at least 19 other states in the country.

To date, a statewide data integration task has been completed resulting in a comprehensive reservoir water-quality database that can be of immediate use to resource managers. Water-quality samples also have been collected at golden alga-affected and unaffected reservoirs on the Brazos and Colorado Rivers. A study of land use change in the Upper Colorado River Basin was started because changes in land use also may correlate with changes in invasive species (golden alga) abundance.

*Learn more from Burley and others (2011), available at <http://pubs.usgs.gov/ds/594/>.*

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**NCCWSC projects are partnership-driven. Here is a sampling of the many collaborators with whom USGS scientists across the Nation are cultivating research and resource management relationships:**

- Auburn University
- Colorado State University
- Desert Fish Habitat Partnership
- Eastern Brook Trout Joint Venture
- Everglades National Park
- Florida State University, Tallahassee
- Great Northern LCC
- Michigan Department of Natural Resources
- Michigan State University
- Minnesota Department of Natural Resources
- NASA Jet Propulsion Laboratory
- Nebraska Cooperative Fish and Wildlife Research Unit
- Northern Great Plains Joint Venture
- Northern Prairie Wildlife Research Center
- Oregon State University
- Pennsylvania State University
- Prairie Pothole Joint Venture
- Plains and Prairie Potholes LCC
- Prince William Sound Science Center
- Purdue University
- Texas Parks and Wildlife
- Texas Tech University
- Trout Unlimited
- University of Florida, Gainesville
- University of Maine
- University of Minnesota, Duluth
- University of Missouri
- University of Washington
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- U.S. Forest Service

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